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Equipment for Research on True Three Dimensional Displays

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6. AUTHOR(S)

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12 a. DISTRIBUTION / AVAILABILITY STATEMENT

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12 b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Equipment is described that was purchased for the study of nonlinear absorption in dyes for use in true, three dimensional displays. A pair of optical parametric oscillators pumped by the same frequency tripled, Q-switched Nd:YAG laser was purchased from Spectra Physics Inc. and installed with appropriate beam control optics. LabView drivers for the laser and the OPOs were written and combined in a master driver controlling the diagnostic equipment and, thus, the data acquisition. This system was tested out and will be used in the study of dye doped media for true three-dimensional displays.

14. SUBJECT TERMS

three-dimensional displays, optical parametric oscillator

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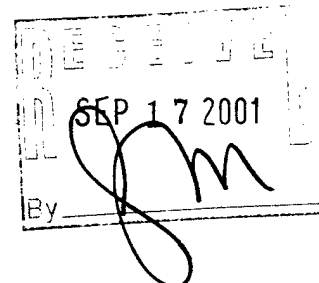
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September 12, 2001

U.S. Army Research Office
ATTN: AMSRL-RO-BI (TR)
P.O. Box 12211
Research Triangle Park, NC 27709-2211

Subject: Final Report for Contract # DAAD190010132

To Whom It May Concern:

On behalf of Dr. Michael Bass and Dr. Nabeel Riza, we are pleased to submit an original +2 copies of the Final Report for a project entitled "Equipment for Research on True Three Dimensional Displays".

Please feel free to contact me at (407) 823-6825 or at nphansti@mail.ucf.edu if you have any questions or concerns. Thank you.

Sincerely,

A handwritten signature in black ink that reads 'Nicole J. Phanstiel'.

Nicole Phanstiel
Proposal Administrator
School of Optics/CREOL

Enclosure

cc: M. Bass, School of Optics/CREOL - UCF
M. Chandra, OSR - UCF (Account # 65-03-521)
Dr. Michael Gerhold, Electronics Division- Army Research Office,
Department of the Army, P.O. Box 12211, Research Triangle Park, NC,
27709-2211

MEMORANDUM OF TRANSMITTAL

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☒ Final Progress Report (Orig + 2 copies)

CONTRACT/GRANT NUMBER: DAAD190010132

REPORT TITLE: Equipment for Research on True Three Dimensional Displays

is forwarded for your information.

Sincerely,

Nicole J. Phamstiel

Final Report

Equipment for Research on True Three Dimensional Displays

U.S. Army Research Office
DURIP Award No. DAAD190010132

By

Michael Bass, P.I.
School of Optics/CREOL
University of Central Florida
Orlando, FL 32816

UCF Acct. No. 65-03-521

1. Forward

Not required.

2. Table of Contents

Not applicable.

3. List of Appendixes, Illustrations and Tables

Table I: Purchased Equipment

4. Statement of Problem Studied:

Equipment to enable studies of dyes with large two photon absorption cross sections and strong visible light emission was required to conduct research on true three-dimensional displays. These displays would employ a volume of dye doped polymer that could be excited to emit visible light by simultaneous absorption of two different wavelength near infrared exciting beams of light in the volume in which the beams intersected. This type of medium is of interest because it is the only potential three-dimensional display medium that can be scaled to the necessary size at reasonable cost. Initial selection of the dyes needed to enable such displays could be made by examining their linear absorption spectra. However, two widely but independently tunable, temporally synchronized sources of near infrared light were required to explore the nonlinear absorption properties of these dyes and to properly evaluate their potential. Thus, this program of purchasing the necessary tunable light sources was undertaken.

5. Summary of the Most Important Results:

We used the funds provided by this grant to purchase a pair of optical parametric oscillator (OPO) light sources. These were pumped by a 10 Hz, Q-switched, flashlamp pumped Nd:YAG laser that was then tripled in frequency to provide the pump light. The signal outputs of these OPO sources is in the visible from about 400 to 800 nm. The idler outputs is in the near infrared, from ~800 to 2000 nm, and provides the light need for the nonlinear absorption studies. The signal light is used to check on the excitation spectrum of the dyes and to serve to excite emission to provide emission spectra. The OPO pulses are about 5 nsec in duration and so small mismatches in the length of the optical paths from each OPO to the target are unimportant. This would not have been so if we had purchased OPOs pumped by mode locked lasers producing pulses having durations of a few picoseconds. The purchased equipment is summarized in Table I.

Table I: Purchased Equipment

Item	Description	Manufacturer	No.
1	Model PRO-290-10 – Nd:YAG laser Oscillator/Amplifier. 2000mJ at 1064 nm with 70% Gaussian fit beam. Nominal repetition rate is 10 Hz.	Spectra Physics	1
2	Quanta-Ray BeamLok-355 option –	Spectra Physics	1
3	EEO-4-355 – Enhanced energy option for LAB and PRO series lasers.	Spectra Physics	1
4	MOPO-PO –Optical Parametric Oscillator tunable from 410 to 2200 nm.	Spectra Physics	2
5	NSI – Beamsplitter Assembly	Spectra Physics	1
6	Laser Energy Meter	Ophir Ltd.	1
7	Optics and Optical Hardware	Various	TBD
8	1 Week Training Course at Spectra Physics	Spectra Physics	3

We outfitted the laboratory with the necessary cooling water, nitrogen gas and electrical service to operate the Nd:YAG laser and OPOs. They were installed by Spectra Physics in our laboratory in the spring of 2001. This was a lengthy process involving two different field service representatives, one for the Nd:YAG laser and another for the OPOs. Following installation we determined that the spatial distribution of the OPO output, though quite good, needed further cleaning up to satisfy the needs of our experiments. Thus, two spatial filtering systems of hardware, optics and pinholes were ordered from Coherent Optics. We also determined what type of polarizer pair attenuators we needed to control the light energy incident in our dye samples. These were also ordered. These components and associated hardware were obtained by the early summer of 2001.

We installed the beam controlling optics and began testing the combined OPOs and optical trains to make ready for studies of nonlinear absorption in dyes for three dimensional displays. This work also involved writing LabView drivers for the Nd:YAG laser and the OPOs as well as for our diagnostic equipment. These drivers were controlled by a master driver that, in proper sequence, calls for functions of the various instruments and storing of the data.

As a prelude to nonlinear absorption studies we tested the OPO system and our data handling facilities by measuring the excitation spectra of the well-known dye, Rhodamine B. We also tested a temperature sensitive paint for its excitation and emission spectra as a service for a colleague in Mechanical, Materials and Aerospace Engineering. As we finished these trials one of the OPO tuning drive motors failed. This is being repaired by Spectra Physics and we expect to be taking nonlinear absorption data before mid September 2001.

6. Listing of Publications and Reports

There were no publications or reports supported under this grant since it was for the specific purpose of purchasing equipment.

7. List of all participating Scientific Personnel

Name	Title
Michael Bass	Professor and P.I.
Alexandra Rapaport	Research Scientist
Ferenc Szipocs	Graduate Research Assistant
Janet Milliez	Graduate Research Assistant

8. Report of Inventions

There were no inventions supported by this grant.

9. Bibliography

None

10. Appendices

None